

DON W5ORW

**INSTRUCTION MANUAL
FOR
MORROW
RECEIVER
MODEL
MBR 5**

**Radio Receiving Equipment for
Mobile and Fixed Stations**

**AN UNUSUALLY VERSATILE AND SENSITIVE
COMMUNICATIONS RECEIVER.**

**ANOTHER MORROW---YEARS AHEAD ---
AMATEUR COMMUNICATIONS RECEIVER**



Printed in U.S.A.

Price \$1.00

STANDARD FORM WARRANTY

ADOPTED by the RADIO MANUFACTURERS ASSOCIATION, INC.

This equipment is warranted to be free from defective material and workmanship and repair or replacement will be made of any part which under normal installation, use and service discloses defect, provided the unit is delivered by the owner to the manufacturer or through the authorized radio dealer or wholesaler from whom purchased, intact, for examination, with all transportation charges prepaid to the factory, within ninety days from the date of original shipment from the factory, and provided that such examination discloses in the manufacturer's judgment that it is thus defective.

This warranty does not extend to any radio products which have been subjected to misuse, neglect, accident, incorrect wiring, improper installation, or to use in violation of instructions furnished by the manufacturer, nor extend to units which have been repaired or altered outside of the factory, nor to cases where the serial number thereof has been removed, defaced or changed, nor to accessories used therewith of other manufacture.

Any part of a unit approved for remedy or exchange hereunder will be remedied or exchanged by the authorized radio dealer or wholesaler without charge to the owner.

This warranty is in lieu of all other warranties expressed or implied and no representative or person is authorized to assume for the manufacturer any other liability in connection with the sale of their radio products.

Mornew Radio Mfg. Co., reserves the right to make any changes in design or to make addition to, or improvements in, its products without imposing any obligations upon itself to install them in its products previously manufactured.

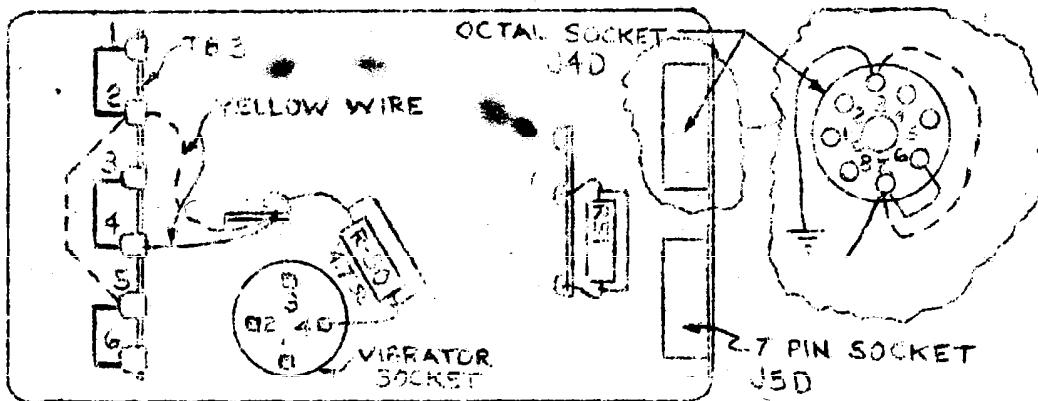
For 6 volt operation the power supply is equipped with a Mallory 659 vibrator. For 12 volt operation the power supply is supplied with a Mallory G 659 vibrator. These vibrators are much quieter in operation than a compromise type. When changing from 6 to 12 volt operation or vice versa the vibrator type must be changed. The following are recommended:

For 6 volts use Mallory 659 vibrator

For 12 volts us Mallory G 659 vibrator

Universal voltage vibrator types which can be used are the Mallory 4501 and 1501. These two vibrator types can be used inter-changeably on 6 or 12 volts.

**INSTRUCTIONS FOR CHANGING MORROW MODEL RVP-250
POWER SUPPLY FROM 6 to 12 VOLT OPERATION**



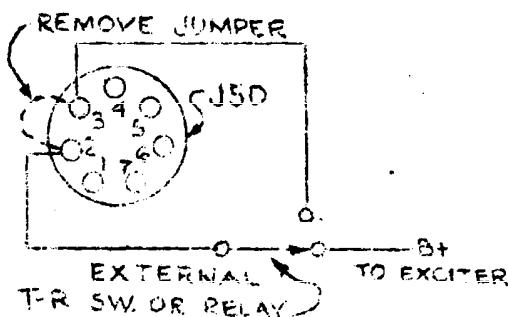
Bottom view power supply

TO CHANGE FROM 6 VOLT TO 12 VOLT OPERATION:

1. Remove jumper from terminals 1 and 2, TB3.
2. Remove jumper from terminals 3 and 4, TB3.
3. Remove jumper from terminals 5 and 6, TB3.
4. Move yellow wire (between R50 and TB3) from terminal 4 to terminal 2. (Dashed line-----).
5. Place #14 wire jumper from terminal 2 to terminal 5 (dashed line-----).
6. Remove jumper from R-50.
7. Remove jumper from R-51.
8. Remove wire from pin 3 (octal socket J4D) to common ground lug.
9. Remove jumper between pins 6 and 7 on socket J4D.
10. Add jumper from pin 3 to pin 7 on socket J4D. (Dashed line -----).

TO CHANGE BACK TO 6 volt OPERATION, REVERSE PROCEDURE.

Note: If power supply is used to supply exciter voltage, jumper between pins 2 and 3, J5D, must be removed. Power to receiver and exciter is controlled by an external transmit-receive switch or relay, connected as shown in sketch.



MORROW MBR-5 RECEIVER

FEATURES:

1. Dual Conversion Superheterodyne Circuit.
2. Tunes 10-15-20-40-75-80 meter bands.
3. Illuminated slide ruledial.
4. High Sensitivity - Exceptional Stability
Five individually temperature compensated oscillator coils.
5. Excellent Signal to Noise Ratio.
6. Series Gate Automatic Noise Limiter.
7. High Stability Clapp type Beat Frequency Oscillator.
8. Exclusive MORROW Noise Balanced Squelch.
9. Sensitive "S" Meter on front panel.
10. Built-in Field Strength Meter.
11. Antenna Trimmer on front panel.
12. Built-in 100 KC Crystal Calibrator.
13. Front panel Oscillator Calibrate Control.
14. 13 tubes incorporating 20 individual functions.
15. Compactness - less than 0.2 cubic feet.

SECTION I. DESCRIPTION

1-1. GENERAL

The Morrow MBR-5 is a new concept in amateur receiving equipment. Thirteen tubes, exclusive of power supply, are utilized to provide 20 tube functions in an advanced dual conversion superheterodyne circuit. AM, CW, and SSB signals may be received throughout the 10-15-20-40-75 meter amateur bands.

The slide rule edge illuminated dial is controlled by a 12 to 1 tuning ratio knob. The dial is calibrated to better than one percent, and all band edges start and stop at the same dial settings. A three gang tuning capacitor tunes the RF amplifier grid, mixer grid, and Clapp type oscillator circuits. High stability ceramic trimmers are used throughout the mixer and oscillator tuned circuits. The LC ratios were carefully chosen to give the highly desirable band spread ranges. The Antenna Trimmer is located on the front panel in order that the antenna circuit may be peaked on each band. All five oscillator coils have individual negative temperature compensating capacitors to insure freedom from drift. In addition a front panel oscillator trimmer is provided to assure precise calibration. This Calibrate control may be used in conjunction with the built in 100 KC crystal calibrator to reset the dial calibration of the receiver. The Calibrate control may also be used without the crystal calibrator as a very fine Band Spread Control.

The first IF amplifier consists of four tuned circuits operating at 1525 KC followed by a combined oscillator - second mixer. The output of the second mixer is in turn fed through the second IF amplifier, which is made up of six tuned circuits at 200 KC, followed by a diode detector. Three stages of audio amplification and an external speaker complete the audio section of the receiver. A highly stable Clapp type Beat Frequency Oscillator provides for the reception of both CW and SSB signals. The Automatic Noise Limiter is of the series gate type, and is very effective on pulse type noise such as ignition interference. The exclusive Morrow Noise Balanced Squelch quiets the receiver during the absence of a signal, and makes practical the monitoring of nets or stations under standby conditions. A meter on the front panel is used as a sensitive VTVM type Signal Strength Meter, or at the flick of a switch, as a Field Strength Meter for accurately tuning the transmitter for maximum output. To complete the receiver a separate 6-12 volt D-C power supply or an 115 volt AC power supply is furnished.

1 -2. TUBE COMPLEMENT

The MBR-5 Receiver is supplied complete with all tubes which are tested in the receiver during checkout.

Tubes are as follows:

V1	6BZ6	RF Amplifier
V2A	1/2 12AT7	First Mixer
V2B	1/2 12AT7	High Frequency Oscillator
V3	6BJ6	First IF Amplifier
V4	6BE6	Second Mixer & Crystal Oscillator
V5	6BJ6	Second IF Amplifier
V6A	1/2 6T8	Diode Detector and AVC
V6B	1/2 6T8	Beat Frequency Oscillator
V7	6BJ6	Crystal Calibrator Oscillator
V8A	1/2 12AT7	Noise Balance Amplifier
V8B	1/2 12AT7	Signal Strength D-C Amplifier
V9	6AL5	Noise Balance Rectifier
V10A	1/2 6AL5	Field Strength Rectifier
V10B	1/2 6AL5	Automatic Noise Limiter
V11A	1/2 12AX7	First Audio Amplifier
V11B	1/2 12AX7	Squelch Control
V12	6C4	Second Audio Amplifier
V13	6AQ5	Audio Power Output

1-3. RADIO FREQUENCY SYSTEM

The Frequency coverage of the MBR-5 is as follows:

Band Frequency

75 Meters	3.5 - 4.0	MC
40 Meters	7.0 - 7.3	MC
20 Meters	14.0 - 14.35	MC
15 Meters	21.0 - 21.45	MC
10 Meters	28.0 - 29.7	MC

The antenna is link coupled to the tuned grid circuit of the RF Amplifier, V-1. The proper coil and link is selected by switches S6, S5A and S5B. The RF Amplifier, V-1, is in turn linked coupled to the tuned grid circuit of the First Mixer, V-2A. The proper coil and link is selected by switches S3, S4A and S4B. The Antenna circuit may be trimmed up by adjusting the front panel "Ant Trim" control to compensate for the varying antenna characteristics encountered on the different bands. A very effective tuned radio frequency trap has been installed in the plate circuit of the RF amplifier to stop broadcast break-through at the first IF frequency. The High Frequency Oscillator is of the highly stable Clapp type, and each of the five coils has an individual negative temperature compensating capacitor to insure freedom from drift. The proper oscillator coil and associated capacitors is selected by switches S1 and S2. Switches S1 thru S6 are ganged together on one shaft to form the Band Switch. All coils except those of the band in use are shorted out by the special wafer switches S1, S2, S3, and S6. A front panel oscillator Calibrate Control, C-39, has been provided to allow slight changes to be made in the oscillator frequency.

The built in 100 KC crystal oscillator, V7, is coupled into the antenna circuit of the receiver, and provides marker signals every 100 KC throughout the frequency range of the receiver. Plate voltage for V7 is switched on or off by the Calibrator Switch, S8, to control the crystal calibrator operation. The Calibrate Control may be used in conjunction with the Crystal Calibrator to reset the receiver dial from time time as component aging occurs. It may also be used without the Crystal Calibrator as a very fine band spread control, such as might be desirable when receiving single sideband signals. All variable capacitors in the RF system are of the ceramic Insulated type to insure high stability.

1-4. INTERMEDIATE FREQUENCY SYSTEM

The output of the First Mixer, V2A, is fed through a stage of 1525 KC, IF amplification. This stage is made up of two double tuned iron core IF transformers (T1, T2), separated by the first IF amplifier tube V3. The

first IF stage is followed by a combined second mixer and 1725 Crystal Oscillator, V4. The 200 KC difference frequency (1725 - 1525) is fed thru two cascaded, double tuned, iron core IF transformers (T3, T4) to the second IF amplifier, V5, and thru the last IF transformer, T5 to the diode detector, V6A. The gain of the IF system is controlled by the front panel mounted "RF GAIN" control, a rheostat in the cathode circuit of both first and second IF Amplifier tubes. The diode detector stage provides both an audio component, for further amplification, and a negative D-C voltage for automatic volume control use. Coupled into the plate circuit of the diode detector is the 200 KC center frequency signal from the Beat Frequency Oscillator. The signal is variable either side of the center frequency by means of the panel mounted "BFO" trimmer, C78. The oscillator is of the highly stable Clapp type, and is virtually unaffected by variations in supply voltages.

1-5. AUXILLARY SYSTEMS

A. V.C.

The Automatic Volume Control voltage supplied by the diode detector passes thru the AVC switch, S9A, and is filtered by the network, R21, C38, before being applied to the RF and IF amplifier grids. Switch S9A controls the application of the AVC voltage, i.e., it is used in both "AVC" and "F.S." positions of the switch, but is not applied in either "MAN" or "BFO" positions.

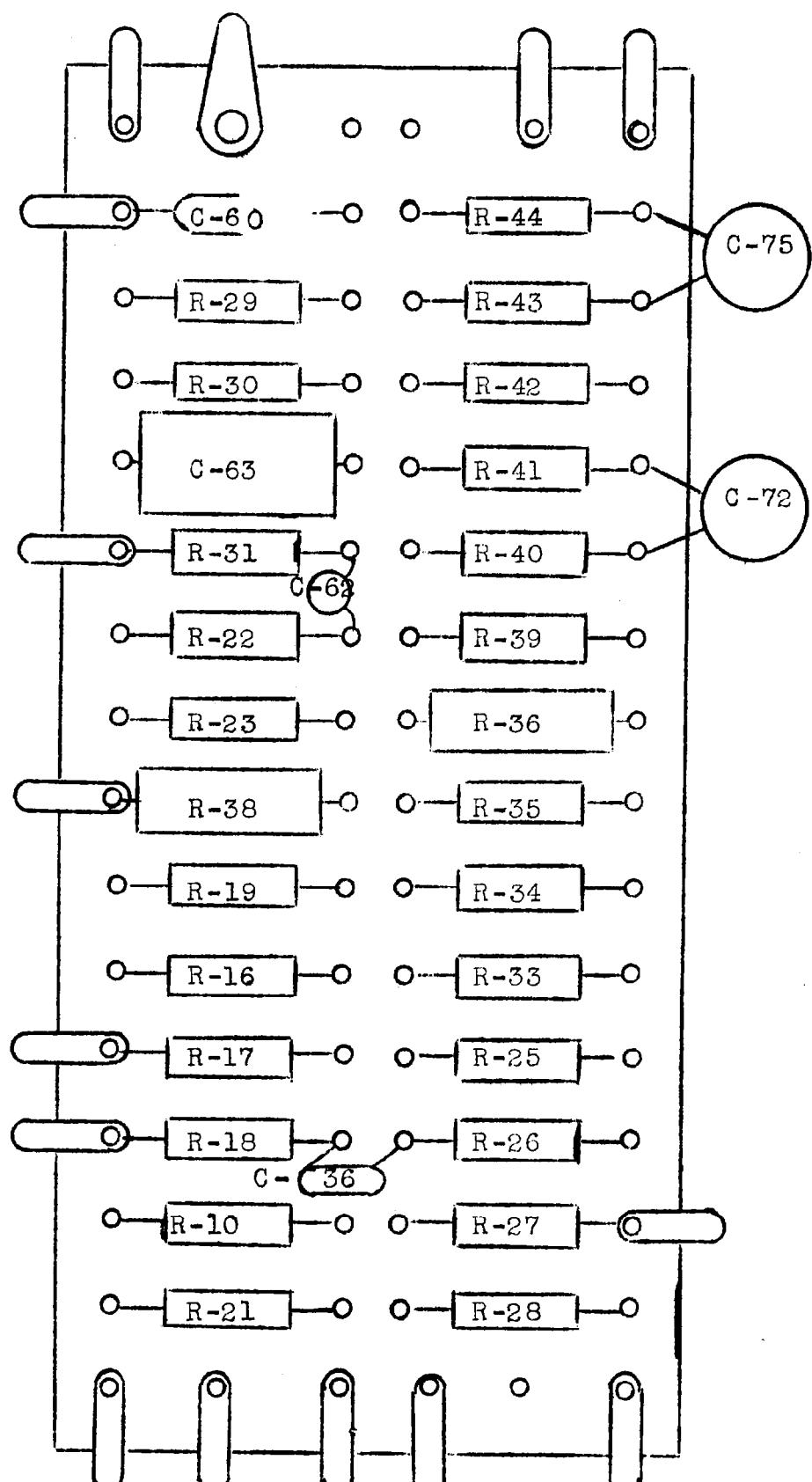
"S" METER

AVC voltage taken from the junction of R27, R28, and C65, is applied as a controlling bias on the grid of the Signal Strength Meter Tube, V8B. This tube acts as a variable resistor across one arm (R18) of the resistor bridge, R16, R17, R18, and R19. As the received signal strength increases the AVC voltage follows and applies in increasingly negative voltage to the grid of V8B. Thus the tube draws less current causing the plate voltage to rise. This unbalances the resistance bridge and allows current to flow thru the meter, causing the meter to deflect in relationship to the received signal strength. The "S" meter operates on both the "AVC" and the "MAN" positions of the panel switch, S9.

FIELD STRENGTH METER

When the panel switch S9, is placed in the "F.S." position, the meter is connected into the cathode circuit of the Field Strength Diode, V10A. Thru the use of a sampling antenna connected at jack J2, RF energy radiated from a nearby transmitting antenna is applied to the plate of V10A. The RF voltage is rectified by the diode and charges capacitor C59. The meter

TERMINAL BOARD



FRONT

then reads the voltage developed across the capacitor and indicates the relative field strength of the transmitter. This is a very valuable aid in accurately tuning a transmitter for maximum output.

SQUELCH

The Noise Balanced Squelch is a MORROW exclusive, and will be found in no other amateur receiver. When the squelch is being used, no noise will appear between stations, i.e., the receiver is quieted in the absence of a signal. All readable signals, however, will be heard due to the fact that the signal is always compared to the noise before the squelch is opened.

The Squelch Control Tube, V11B, is a D-C amplifier with its grid operated by the AVC voltage and whose plate current flowing thru R34 biases the First Audio Amplifier, V11A, to cut off when the AVC voltage is low. When the AVC voltage rises, this increases the bias on V11B, and cuts the tube off. Under these conditions, no plate current flows thru R34 and V11A operates in a normal manner. From this it may be noted that any increase in AVC voltage; whether from a signal or noise; would, unless prevented, open the squelch and allow the first audio amplifier to operate. This condition is found in most other receivers which have a squelch, and it is very undesirable to have a noise open the squelch and allow the noise to appear at speaker when no signal is present.

The MORROW Noise Balanced Squelch overcomes this undesirable condition by balancing the AVC voltage against the noise. High frequency noise voltage appearing at the Diode Detector is fed thru the low value coupling capacitor, C60, to the grid circuit of the Noise Amplifier, V8A. The amplified noise is rectified by the Noise Rectifier, V9, and produces a voltage across R30 with polarity in opposition to the AVC voltage. The magnitude of the opposing voltage is controlled by the adjustment of the rear panel mounted potentiometer, R20.

SQUELCH ADJUSTMENT

To adjust the Noise Balanced Squelch, have the AVC on, front panel "SQUELCH" control, R27, off (counter clockwise), RF "GAIN" full on, "ANT TRIM" tuned for maximum noise, no signal being received, R20, off (counter clockwise as viewed from front of receiver), and the antenna removed from the receiver. Turn the front panel "SQUELCH" control until the squelch just closes. Plug the antenna back into the receiver and turn the Noise Balance control, R20, until the squelch closes. It is important that no signal is being received whil this adjustment is made. A slight interaction may be noted between R37 and R20. When this ad-justment is finished, only those signals which are readable should open the squelch.

NOISE LIMITER

The audio output of the Diode Detector is fed directly into the Automatic Noise Limiter network, R25, R26, R27, R28, and C65; and the ANL Diode V10B. This diode is switched into the circuit or is shorted out by switch S7A. The limiter, being of the series gate type, will pass audio signals to the audio volume control and amplifier stages in a normal manner as long as no noise peak is present. However, when a noise peak appears across the Diode load, R25, and R26, the Limiter Diode is suddenly biased to the point where conduction stops, and the noise is limited to a low value before it can enter the audio system.

1-6. AUDIO SYSTEM

The audio system consists of three stages of audio amplification. The First Audio Amplifier, V11A, follows the audio "Volume" control, R32, and its operation is controlled by the Squelch Control Tube, V11B. The Second audio Amplifier, V12, operates with reduced, but sufficient gain to drive the Audio Output Amplifier, V13, to full output. The output stages couples thru the output transformer, T7, to Speaker Jack, J3, on the rear panel of the receiver. The output impedance of the receiver is 3.4 ohms.

POWER SUPPLY SYSTEMS

Because the MBR-5 is a universal receiver two power supplies are available for use either in mobile application or as a fixed station receiver at home.

6-12 VOLT D-C POWER SUPPLY

The RVP-250 power supply is a 6 or 12 volt D-C supply. It not only supplies power for the receiver but also supplies exciter "B" supply for the transmitter. Cables are available for connecting the transmitter to this power supply and the switching of the "B" supply is all done in the transmitter. Sockets for this cable are wired into the power supply, making it merely a matter of plugging a cable into a socket.

When the receiver is in "SEND" position the relay "RY" is open and the vibrator does not run. When in the "RECV" position the relay is closed and the vibrator supplies power to the receiver. Terminals TB-2 make the relay coil available for switching off the vibrator by the antenna relay providing a transmitter other than the Morrow MB-560 is used.

To change the RVP-250 from 6 to 12 volts the following conversion must be done. When converting from 12 to 6 volts the steps should be done in reverse.

1. Remove three jumpers from power transformer terminal board, shown in dotted lines labeled 6V on the diagram.
2. Install one jumper on power transformer terminal board, shown in dotted lines labeled 12V.
3. Remove jumpers from R50 and R51 as shown.
4. Remove jumper from pins 1 to 3 on eight pin socket, J4D.
5. Remove jumper from pins 6 to 7 on eight pin sockets, J4D.
6. Install jumper from pins 3 to 7 on eight pin socket, J4D.

115 VOLT AC POWER SUPPLY

The AC power supply RAP-250 operates the receiver filaments in a 12 volt string. It will supply power for the MB-560 transmitter, however a filament transformer must be added for the transmitter. The terminals TB-1 allow the antenna relay to open "B" negative in the receiver for muting when transmitting.

The Jumper TJ on the sockets J5A and J5D may be removed for relay switching of the "B" supply for external transmitter use in case the need arises.

OPERATION AND CONTROLS

Bandswitch, 75-40-20-15-10.

Turn the knob until the dot is under the band on which reception is desired.

CAL.

This control is a trimmer on the receiver local oscillator. It is used in conjunction with the 100 KC calibrator to set the dial pointer exactly on calibration. It may also be used for fine tuning control over a very narrow range.

TUNE

This is a tuning knob and is used to tune the receiver.

ANT-TRIM

The antenna trimmer should be used to adjust the antenna circuit for

each band. It may be set for either the maximum back ground noise or for maximum "S" meter reading.

OFF-CAL-ON

This control is a switch for turning the 100 KC calibrator on or off.

OFF-SEND-RECV-LIM

The control is a switch that turns receiver off in the OFF position, turns the Filaments On in the SEND position, Turns the "B" supply ON in the RECV position and in the LIM position turns on the noise limiter.

If the transmitter has a push to talk relay the control should be left in either the RECV or LIM position when transmitting. Two terminals on the power supply case are wired in such a manner that receiver is muted when the transmitter is on, if the above terminals are connected to the transmitter relay.

If the transmitter is not a push to talk operated unit the switch should be turned to the SEND position when transmitting.

BFO

This control is the beat frequency pitch control and is used for CW work, and for tuning SSB stations. The dot on the knob should be vertical for the BFO to be in the center of the receiver pass band.

VOLUME

This is the audio volume control and for AM service should be set for desired volume. For CW and SSB reception it should be turned full on.

SQUELCH

The Morrow Noise Balance Squelch is a new feature found only in Morrow amateur receivers. It is a great boon for mobile and fixed station reception.

To set the Squelch, turn the control CW to the right until the Squelch just closes i. e., the receiver is silent.

Note: The following adjustments must be made when the receiver is first installed and after once made they need no longer be considered.

1. Have the receiver operating with the squelch control full counterclockwise, or in the off position. Tune the receiver off a signal and adjust the antenna trimmer for maximum background noise. (any band.)
2. Turn the noise balance control on the back of the receiver full clockwise, when viewed from the back (or full counter-clockwise when viewed from the front.) The control is the one nearer the center of the back panel and under the speaker output socket.
3. Remove the antenna and turn up the audio volume control.
4. Turn the squelch control on the front panel, clockwise, or on, until the squelch closes, i.e., the receiver is quiet.
5. Connect the antenna. The squelch will have opened. Be sure the receiver is tuned off a station.
6. Turn the noise balance control (on the back of the receiver) up or clockwise (when viewed from the front of the receiver) until the squelch just closes. The squelch is now adjusted and balanced, and will open only on signals that are readable over the prevailing noise level.

RF GAIN

The RF Gain controls the receiver sensitivity. It is used for a volume control when copying SSB and CW stations. When receiving AM signals it is usually turned up full or in the extreme clockwise position. It will be noted the RF Gain can be changed at any time without changing the pitch of CW or SSB stations, because of the stability of the receiver.

AVC-MAN-BFO-F.S.

When automatic volume control action is desired, this switch is turned to the AVC position. When manual gain control action is desired the switch should be turned to MAN. The "S" meter functions in these two positions.

When the Switch is in BFO position the Beat Frequency Oscillator is on. This position is used for CW and SSB reception. The "S" meter is out of the circuit in the BFO position.

F.S. is a position that is used to switch the meter from "S" meter circuit to the Field Strength circuit. When in this position the transmitter may be turned for maximum output, and at the same time the antenna may be turned to the transmitter frequency for much better mobile signal strength.

THE MBR-5 RECEIVER WAS CAREFULLY ALIGNED BEFORE SHIPPING FROM THE FACTORY AND THE ALIGNMENT SHOULD NOT BE TAMPERED WITH UNLESS THE NEED IS DEFINITE, AND THEN ONLY QUALIFIED PERSONS SHOULD ATTEMPT THE JOB.

The equipment needed is listed below:

1. Signal generator with output on 200 KC, 1525 KC, 3.5 to 4 MC 7.0 to 7.3 MC, 14.0 to 14.35 MC, 21 to 21.45 MC, and 28.0 to 29.7 MC.
2. A BC221 or other good frequency standard for calibration of the signal generator.
3. A D-C Vacuum Tube Voltmeter with low range scales in the order of 2.5 to 10 volts full scale.

When aligning the receiver the chassis should be removed from the cabinet and the receiver should be warm, or operating for 15 minutes.

ADJUSTMENT OF 1725 KC OSCILLATOR

The equipment needed is a D-C VTVM with a 10 volt range. A 2.2 meg resistor should be in series with the probe.

1. Attach VTVM to V4 grid pin #1 and adjust L17 for maximum reading. The voltage should be approximately 6-7 volts.

200 KC AMPLIFIER

Equipment needed: Signal generator with 200 KC output. VTVM with a 2.5 to 3 volt scale.

1. Connect VTVM diode load at junction of R10-R26-R27, loaded on the front part of resistor board.
2. Use 0.1 mfd condensers in series with signal generator and connect hot leads to V5 pin #1, and ground lead chassis. With modulation off set generator to exactly 200 KC.
3. Set RF gain control full on. Set AVC Switch on manual. Set audio gain full on. Squelch control off, counter clockwise.

4. Always use lowest output from generator that will give a reliable VTVM reading and adjust cores in T5 for maximum reading.
5. Move generator to grid of V4, pin #7. Adjust cores in T3 and T4 for maximum reading. Readjust core in T3-T4-T5 for maximum reading. Use lowest generator output.

ADJUSTMENT OF B.F.O.

6. Set B.F.O. trimmer to one half capacity and be sure that dot on knob is vertical. Turn on B.F.O. switch on front and adjust core in T6 for zero beat. Turn B.F.O. switch back to manual position.

ADJUSTMENT OF 1525 KC AMPLIFIER

Equipment needed: Signal generator with 1525 KC output. VTVM with 2.5 to 3 volt scale.

7. With VTVM connected as in (1) above, connect signal generator to grid of V2A, or tuning condenser center stator. Set generator to 1525 KC and adjust cores in T2 and T1 for maximum VTVM reading. Use lowest generator output for reliable reading.

ADJUSTMENT OF 1525 KC TRAP

8. Connect generator to antenna connector. Increase generator output for VTVM reading. Adjust 1525 KC trap core, L11, for MINIMUM VTVM reading. Trap located on oscillator section, core far left.

ADJUSTMENT OF 100 KC CALIBRATOR

9. The 100 KC calibrator is carefully set at the factory to frequency and should not need attention. In case this frequency wants to be checked it should be compared to WWV on 5-10-15 MC. The Calibrator may be coupled to another receiver by running a wire from the MBR-5 antenna socket to the receiving antenna. It will be noted the calibrator is connected to the receiving antenna input socket, as per the diagram thru a capacitor C50. C55 on the tuner section chassis will allow the zero beating of the crystal to WWV. An error in setting of this capacitor will be multiplied on the higher frequency bands and it must be set as near to zero beat as possible. If there is a preference 15 MC should be chosen as the test frequency.

ADJUSTMENT OF THE HIGH FREQUENCY BANDS

Equipment needed: A signal generator covering 75-40-20-15 and 10 meter bands. A VTVM with a 2.5 to 3 volts scale.

GENERAL INFORMATION

1. The oscillator is always on the high side of the signal.
2. The oscillator capacitors adjust the high end of the band.
3. The oscillator cores adjust the low end of the band.
4. The dial pointer should be at the low end of the dial and 1/8 inch past the last mark when the tuning condenser is closed.
5. It is possible to reach the trimmers for touch up when the receiver is in the case. However, for the main alignment the chassis should be out of the case.
6. The oscillator is compensated for temperature and once set should need no further adjustment. Every precaution has been taken in the manufacture of the MBR-5 receiver to make it as stable as possible and the calibration will be found to be very close when aligned as per the instructions below.
7. In all adjustments below be sure the calibrate trimmer marked "Cal" is set with the dot vertical when the trimmer is in the one half capacity position. This trimmer should be set and then not touched until all the following steps are completed.
8. Any band may be adjusted without affecting any other band.
9. Very little if any oscillator pulling will be noted on any of the low frequency bands. However, on the high bands some may be experienced when the mixer trimmer is adjusted and allowance should be made for this. Sometimes the mixer should be adjusted for maximum noise rather than be tuned for maximum when on signal.
10. The 100 KC calibrator should be used for frequency check on the high frequency bands and do not depend upon the calibration of the signal generator, other than for the first rough calibration.

75 METERS

- 1. Feed 4 MC signal into antenna socket. Set dial 4 MC.**
- 2. Adjust 75 meter Osc. trimmer to frequency. Antenna trimmer and 75 meter trimmer to maximum AVC.**
- 3. Set generator to 3.5 MC and dial to 3.5 MC.**
- 4. Adjust 75 meter Osc. coil core to frequency. (Core thru coil.)**
- 5. Repeat until calibration is correct.**

40 METERS

- 1. Feed 7.3 MC signal into antenna socket and set dial to 7.3 MC.**
- 2. Adjust 40 meter Osc. trimmer to frequency, adjust antenna trimmer and 40 meter mixer trimmer to maximum AVC.**
- 3. Set generator to 7 MC and set dial to 7 MC.**
- 4. Adjust 40 meter Osc. core slug to frequency. (Core thru coil).**
- 5. Repeat until calibration is correct.**

20 METERS

- 1. Feed 14.35 MC signal into antenna socket and set dial to 14.35 MC.**
- 2. Adjust 20 meter Osc. trimmer to frequency, adjust antenna trimmer and 20 mixer trimmer to maximum AVC.**
- 3. Set generator to 14 MC and set dial to 14 MC.**
- 4. Adjust 20 meter Osc. coil core to frequency. (Core started in coil).**
- 5. Repeat until calibration is correct.**

15 METERS

- 1. Feed 21.45 MC signal into antenna socket. Set dial 21.45 MC.**
- 2. Adjust 15 meter Osc. trimmer to frequency. Adjust antenna trimmer and 15 meter mixer trimmer to maximum AVC.**

3. Set generator to 21 MC and set dial to 21. MC.
4. Adjust 15 meter Osc. coil core to frequency. (Core started in coil).
5. Repeat until calibration is correct.

10 METERS

1. Feed 29.7 MC signal into antenna socket and set dial to 29.7 MC.
2. Adjust 10 meter Osc. trimmer to frequency. Adjust antenna trimmer and 10 meter mixer trimmer to maximum AVC.
3. Set generator to 28 MC and set dial to 28 MC.
4. Adjust loop on 10 meter coil. (Coil setting on chassis on bottom of Osc. compartment).
5. Repeat until calibration is correct.

INSTALLATION

When installing the Morrow MBR-5, be sure you have a good mechanical and electrical installation. This is very important because if the installation is not the best, performance can suffer.

The new Morrow Jiffy Mount brackets will make the installation simple. Be sure the bracket is mounted rigid to the underside of the dash. NO RUBBER MOUNTING OR SHOCK MOUNTING OF ANY KIND SHOULD BE USED. The equipment is made to take any vibration that is found on the dash board, and rubber mounting, rather than improving the situation will only make it worse.

Be careful that there is a good bond made to the dash, even if some of the paint must be scraped off. A poor ground or bond can increase the motor noise.

In case there are switches and levers that can not be moved, it may be necessary to use spacers to hold the receiver down for clearance. Use a strap from the back edge of the bracket to the fire wall, in case it is needed. Back clearance is not of any importance because the Jiffy Mount will allow the cable to be installed before the receiver is put in place.

ANTENNA

If other than a Morrow transmitter is installed in the car, by all means use the transmitting antenna for receiving. This will require an antenna relay on the transmitter, (one is built into the Morrow MB-560 transmitter) as it is a very worthwhile investment. A coax relay is not needed, just any good relay that is shielded and mounted in a small metal box.

The antenna will probably be mounted in the rear of the car. For best results for transmitting and receiving, a Morrow MLV-50 antenna tuner should be included. The tuner should be mounted as close to the antenna as possible. In any case be sure the coax, (and by all means use coax) ground should be well fastened to the metal body of the car right at the base of the antenna. It is of utmost importance that the grounding of the coax be perfect inside the car. Always use proper fittings, and be sure they are installed as they should be. All soldered joints should be well made. If these connections are not the best, motor noise will be much higher than necessary. The receiver has a very good limiter but it should not be expected to make up for a poor installation. A loose connection on the antenna lead, or the ground, will make reception intermittent.

LOADING COILS, for bands lower in frequency than the one reception is desired on, must be shorted out or removed. Example: If you are trying to receive on 20 meters be sure the 75 meter or 40 meter coils in the antenna are shorted out. They act as RF chokes and just about kill the receiver. If you are on 10 meters be sure the MLV-50 antenna roller is at the extreme low inductance end.

Do not attempt to use a transmitting antenna on the BC receiver. It is a low impedance device, while the BC antenna must be a high impedance antenna. In case there is no transmitting antenna in the car, a BC antenna can be used on the MBR-5. The performance is not as good as when the transmitting antenna is used, however it is useable. The BC type antenna must also have the coax in perfect condition and all junction boxes, jacks, plugs etc., must be shielded. Do not try to connect two receivers in parallel on one antenna. Use a switch.

MOTOR NOISE

There are five types of noise you may encounter when you install any receiver. They are listed below and the steps that can be taken to overcome them are also listed.

SPARK PLUG NOISE

Spark plug noise, or ignition noise, is the easiest one to detect as it will be a popping sound and will vary with the speed of the motor. Spark plug suppressors on the plugs may improve this type of noise or better yet, use the resistor type plug. There must always be installed a resistor type suppressor in the center lead to the distributor. In bad cases be sure the low tension leads are removed from close contact with the spark plug wires. Check the condenser on the low tension side of the coil and if there is not one installed put one on. This condenser is usually a 1/2 mfd made special for the job. For superior results use a .1 mfd feed thru type condenser. See ARRL handbook, Mobile Equipment Noise Elimination.

Sometimes the distributor cap has burned contacts and they should be inspected. It is possible for broken insulation on the high tension leads to allow sparks to jump to the motor. These should be inspected. Sometimes cables and rods running thru the dash must be bonded right where they go thru the dash. Use spring brass strips under the hood to bond it to the body of the car.

Spark plug noise sometimes can give you a bad time, but usually all the above steps are not necessary. Some cars can be cleaned up and be free from noise, while some cars just do not clean up to a noise free point.

We will qualify clean: No noise of any kind with the limiter in the receiver turned off. An ideal condition very seldom achieved.

GENERATOR NOISE

Generator noise will be a whine that varies with the speed of the motor. Low frequency bands are not bothered too much, but 15 and 10 meters can be wiped out. One of the MORROW GC-10 noise filters will do a good job on most cars. It is a series tuned trap in the armature lead. A feed thru capacitor may also be used, mounted on the generator and connected with very short leads. Never put a condenser on the field terminal!

VOLTAGE REGULATOR

The voltage regulator can be a source of noise and it is of the type that just makes a clatter. If the motor is running slow with the generator not charging the noise will stop. The only way we have found to stop this racket is to install feed thru coax capacitors. See ARRL handbook. The feed thru capacitors are mounted on a good ground right at the regulator. The leads should be as short as possible. One capacitor can be installed in the battery lead and another on the armature lead. The field terminal can be by-passed to ground with a .002 mica capacitor in series with a 4.7 ohm 1 watt carbon resistor. The wires running from the generator to the regulator may be shielded.

WHEEL AND TIRE STATIC

Wheel static will show up with the car in motion and not while it is standing still. The automotive or radio distributor stock special springs to mount in the wheel bearing caps to ground the wheels.

Tire static is developed from the tires running on pavement and this type of trouble can be stopped by pumping a special powder into the tire when it is inflated. This material is available from the same source as the spring above.

GAS GAGE etc.

The gas gage, stop light switch, etc., can cause noise, however these noises are easy to stop by installing a 1/2 mfd capacitor at the nearest point of contact to the switch and ground. Some cars need a capacitor installed where the gas gage wire comes out of the gas tank. Access plates in the trunk of the car make this connection easy to get to.

After the noise is once eliminated, mobiling can be a real pleasure, and we are sure the time spent will be repaid many fold. The Morrow MBR-5 receiver has terrific possibilities and will hear stations you would normally never hear, but it does need a good installation to get optimum results.

SPECIFICATIONS

Sensitivity: 1/2 microvolt

Squelch Opening: 1/2 microvolt

Band width: 4KC at 6 DB down

Audio power output: 4.5 watts

Audio output impedance: 3.4 ohms

"S" meter: 0-1 mill, calibrates "S" 0-9

POWER REQUIREMENTS WITH D-C POWER PACK

6 volts: 10.5 amperes

or

12 volts: 6.0 amperes

POWER REQUIREMENTS WITH AC POWER PACK

6 volts 4.0 amperes

or

12 volts: 2.0 amperes

250 D-C volts at 74 millamperes.

PARTS LIST FOR MBR-5 RECEIVER

CAPACITORS

C1A	RF section, tuning cond.
C1B	Mixer section, tuning cond.
C1C	Oscillator section, tuning cond.
C2	35 mmfd AFC trimmer
C3	0.01 mfd disc 500 v.
C4	0.01 mfd disc 500 v
C5	0.001 mfd disc 500 v
C6	250 mmfd ceramic GP 500 v
C7	0.01 mfd disc 500 v
C8	500 mmfd SM 500 v
C9	0.001 mfd disc 500 v
C10	5-25 mmfd NPO trimmer
C11	5-25 mmfd NPO trimmer
C12	5-25 mmfd NPO trimmer
C13	5-25 mmfd NPO trimmer
C14	5-25 mmfd NPO trimmer
C15	25 mmfd SM 500 v
C16	4.7 mmfd ceramic GP 500 v
C17	0.01 mfd disc 500 v
C18	part of IF transf.
C19	part of IF transf.
C20	part of IF transf.
C21	part of IF transf.
C22	50 mmfd SM 500 v.
C23	50 mmfd SM 500 v
C24	50 mmfd SM 500 v
C25	50 mmfd SM 500 v
C26	50 mmfd SM 500 v
C27	50 mmfd SM 500 v
C28	0.01 mfd disc 500 v
C29	0.01 mfd disc 500 v
C30	50 mmfd SM 500 v
C31	25 mmfd SM 500 v
C32	25 mmfd SM 500 v
C33	0.1 mfd paper 200v
C34	0.1 mfd paper 200 v
C35	200 mmfd ceramic GP 500 v
C36	200 mmfd ceramic GP 500 v
C37	2.2 mmfd ceramic GP 500 v
C38	0.05 mfd paper 200 v
C39	oscillator calibrator

PARTS LIST FOR MBR-5 RECEIVER

(cont. 2)

C40	5-25 mmfd NPO trimmer
C41	5-25 mmfd NPO trimmer
C42	5-25 mmfd NPO trimmer
C43	5-25 mmfd NPO trimmer
C44	5-25 mmfd NPO trimmer
C45	33 mmfd \pm 1.6 mmfd N330 \pm 60
C46	120 mmfd \pm 6 mmfd N470 \pm 60
C47	110 mmfd \pm 5.5 mmfd N470 \pm 60
C48	68 mmfd \pm 3.4 mmfd N470 \pm 30
C49	14 mmfd \pm 1.4 mmfd N1400 \pm 250
C50	2.2 mmfd ceramic GP 500 v
C51	100 mmfd SM 500 v
C52	0.01 mfd disc 500 v
C53	250 mmfd SM 500 v
C54	250 mmfd SM 500 v
C55	5-25 mmfd NPO trimmer
C56	150 mmfd SM 500 v
C57	0.002 mfd disc 500 v
C58	0.01 mfd disc 500 v
C59	0.01 mfd disc 500 v
C60	250 mmfd ceramic GP 500 v
C61	250 mmfd ceramic GP 500 v
C62	0.002 mfd disc 500 v
C63	0.25 mfd MP2P25 200 v
C64	0.1 mfd paper 200 v
C65	0.1 mfd paper 200 v
C66	0.1 mfd paper 200 v
C67	0.1 mfd paper 200 v
C68	0.01 mfd disc 500 v
C69	0.01 mfd disc 500 v
C70	20 mfd electrolytic 25 v
C71	0.002 mfd disc 500 v
C72	0.01 mfd disc 500 v
C73	0.001 mfd disc 500 v
C74	20 mfd electrolytic 25 v
C75	0.01 mfd disc 500 v
C76	20 mfd electrolytic 25 v
C77	0.1 paper 400 v
C78	35 mmfd APC trimmer
C79	250 mmfd SM 500 v
C80	250 mmfd SM 500 v
C81	0.002 mfd SM 500 v
C82	0.002 mfd SM 500 v
C83	0.5 mfd paper 100 v

PARTS LIST FOR MBR-5 RECEIVER

(cont. 3)

C84	0.01 mfd disc 500 v
C85	0.005 mfd buffer 1600 v
C86A	20 mfd electrolytic 350 v
C86B	20 mfd electrolytic 350 v
C87	0.01 mfd disc 500 v
C88A	20 mfd electrolytic 350 v
C88B	20 mfd electrolytic 350 v
C89	0.01 mfd disc 500 v
C90	0.1 mfd paper 400 v

RESISTORS

All resistors 1/2 watt (unless otherwise specified).
K is one thousand ohms and M is one megohm.

R1	100 K
R2	180
R3	2.2 M
R4	
R5	2200
R6	470
R7	20 K pot.
R8	47 K
R9	22 K 2 watt
R10	47 K
R11	47 K
R12	470 K
R13	2200
R14	180 K
R15	100 K
R16	56 K
R17	56 K
R18	330 K
R19	56 K
R20	500 K pot.
R21	2.2 M
R22	2200
R23	220 K
R24	3 K pot.
R25	100 K
R26	100 K
R27	1 M
R28	1 M

PARTS LIST FOR MBR-5 RECEIVER

(cont. 4)

R29	470 K
R30	470 K
R31	470 K
R32	500 K po
R33	470 K
R34	470 K
R35	10 K
R36	82 K 1 watt
R37	20 K pot.
R38	180 K 1 watt
R39	100 K
R40	180 K
R41	47 K
R42	2200
R43	100 K
R44	330 K
R45	470 1 watt
R46	47 K
R47	4.7 1 watt
R48	270
R49	270
R50	27 2 watt
R51	27 2 watt

MISCELLANEOUS PARTS

CH1	filter choke	Precision 41CG11	9HY, 90 MA, 250 ohm
Ch2	filter choke	Precision 41CG11	9HY, 90 MA, 250 ohm

L1	10 meter antenna coil	CF1003
L2	15 meter antenna coil	CF1006
L3	20 meter antenna coil	CF1009
L4	40 meter antenna coil	CF1013
L5	75 meter antenna coil	CF1023
L6	10 meter mixer coil	CF1003
L7	15 meter mixer coil	CF1006
L8	20 meter mixer coil	CF1010
L9	40 meter mixer coil	CF1014
L10	75 meter mixer coil	CF1019
L11	Broadcast trap coil	CF1022
L12	10 meter oscillator coil	CF1005
L13	15 meter oscillator coil	CF1007
L14	20 meter oscillator coil	CF1012
L15	40 meter oscillator coil	CF1016

PARTS LIST FOR MBR-5 RECEIVER

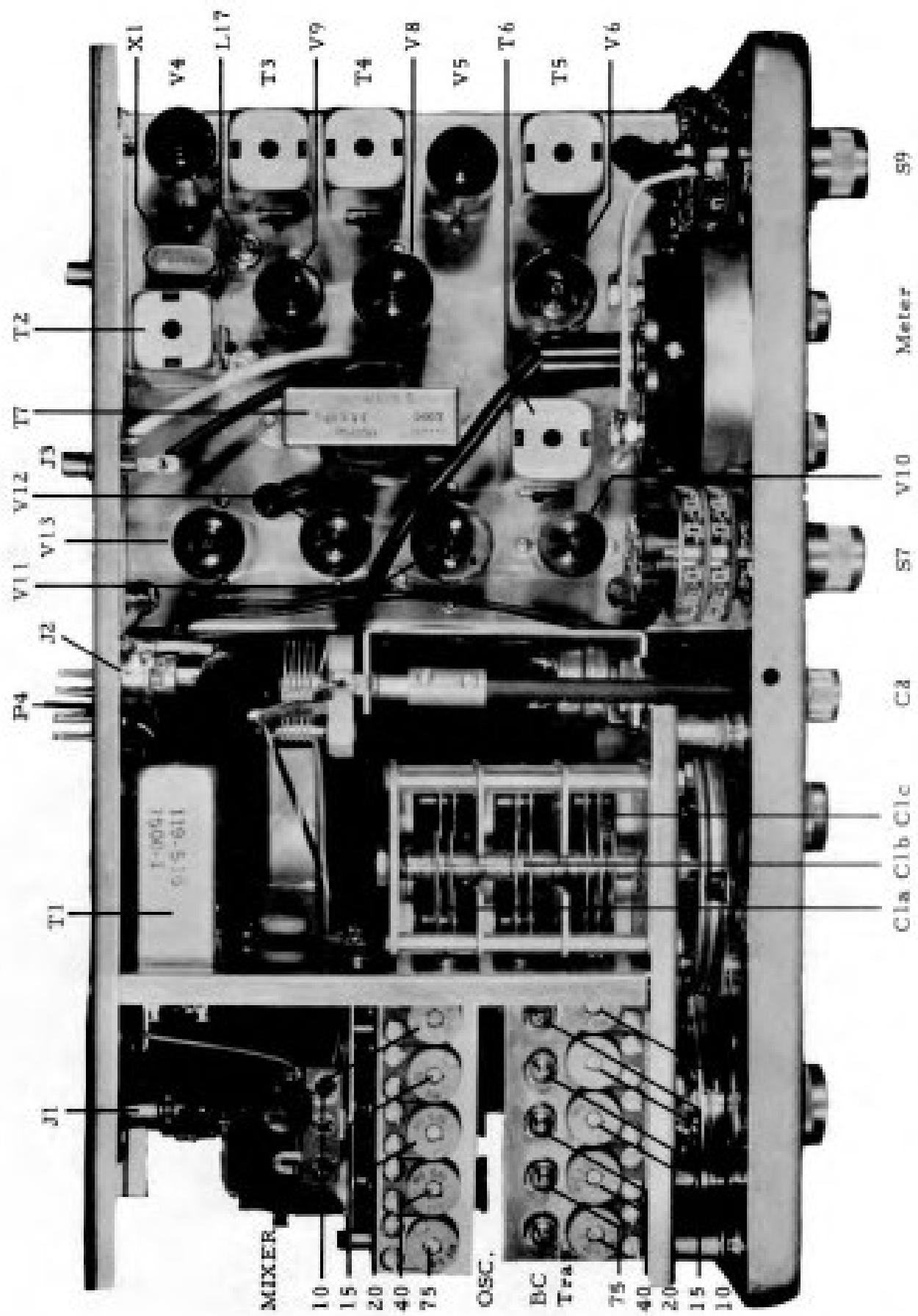
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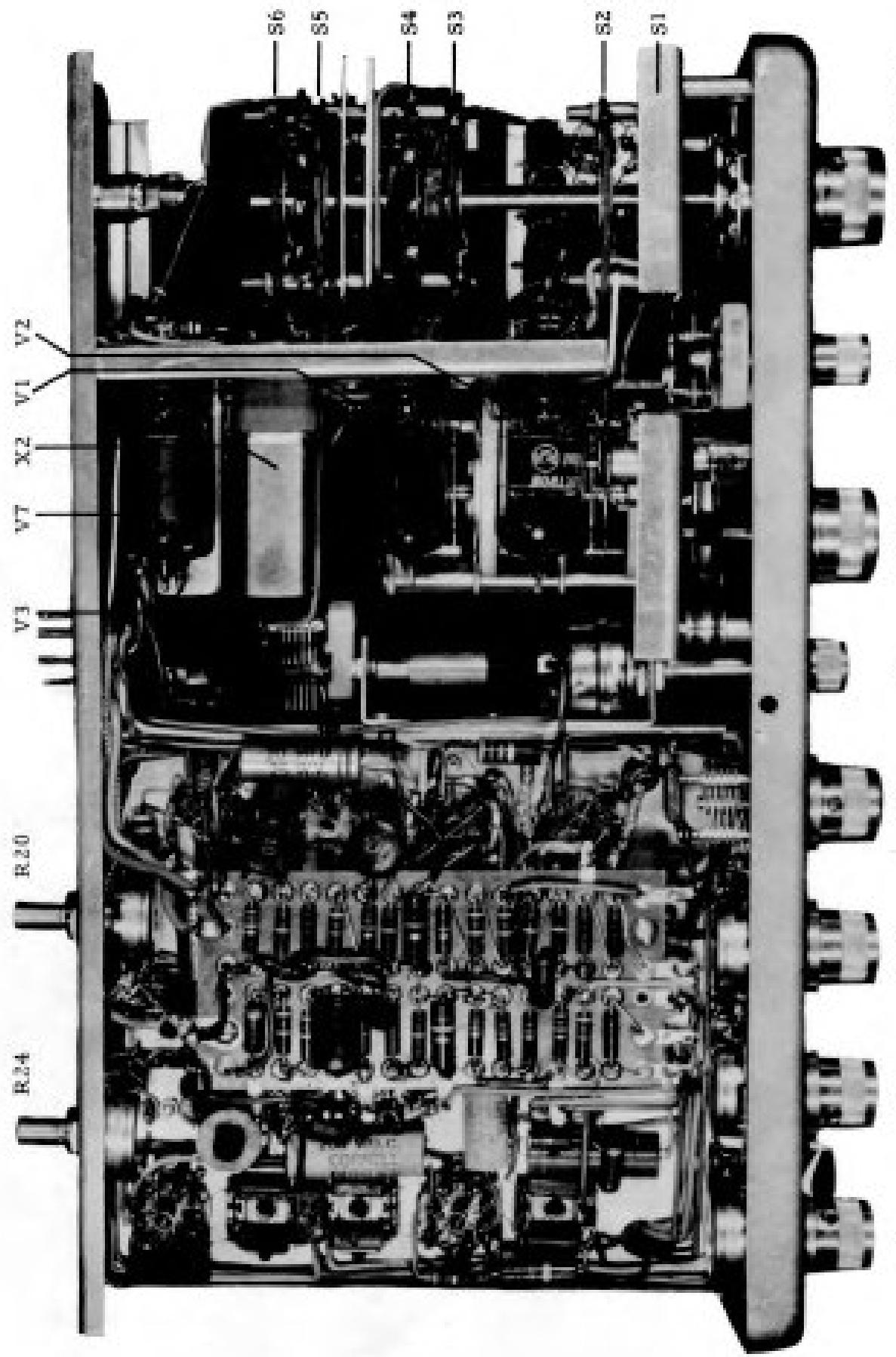
L16	75 meter oscillator coil	CF1022
L17	Oscillator coil, 1725 KC	CF1040
M	0-1 MA meter	
J1	antenna socket	A21-12
J2	Field strength antenna socket	A21-12
J3	Speaker socket	A21-27
J4A	AC power supply socket	77-MIP-8 Amphenol
J4D	D-C power supply socket	77-MIP-8 "
J5A	Transmitter socket (AC)	77-MIP-7 "
J5D	Transmitter Socket (D-C)	77-MIP-7 "
P4	Power supply plug	86-CP8 Amphenol
RFC1	500 microhenry RF choke	CF1032
RFC2	500 microhenry RF choke (in T6)	CF1032
RFC3	500 microhenry RF choke	CF1032
RFC4	500 microhenry RF choke	CF1032
RFC5	RF hash choke	FTR17
RFC6	RF hash choke	FTR17
S1, 2, 3, 6	1 pole, 5 position shorting wafer with off position	A36-31
S4A, 4B	2 pole, 5 position non-shorting wafer with off position	A36-30
S5A, 5B	2 pole, 5 position non-shorting wafer with off position	A36-30
S7A	Noise limiter switch	A36-53
S7B	Send-receive switch	A36-53
S7C	On-off power switch	A36-53
S8	Calibrator on-off switch	A36-51
S9A, B, C, D	AVC, BFO, meter switch	A36-55, 56
T1, T2	1525 KC I F transformer	
T3, T4,		
T5	262 KC IF transformer	
T6	200 KC B.F.O. transformer	
T7	5000 to 3.4 ohm transformer	FTRW18
T8	Vibrator transformer	
T9	AC power transformer	

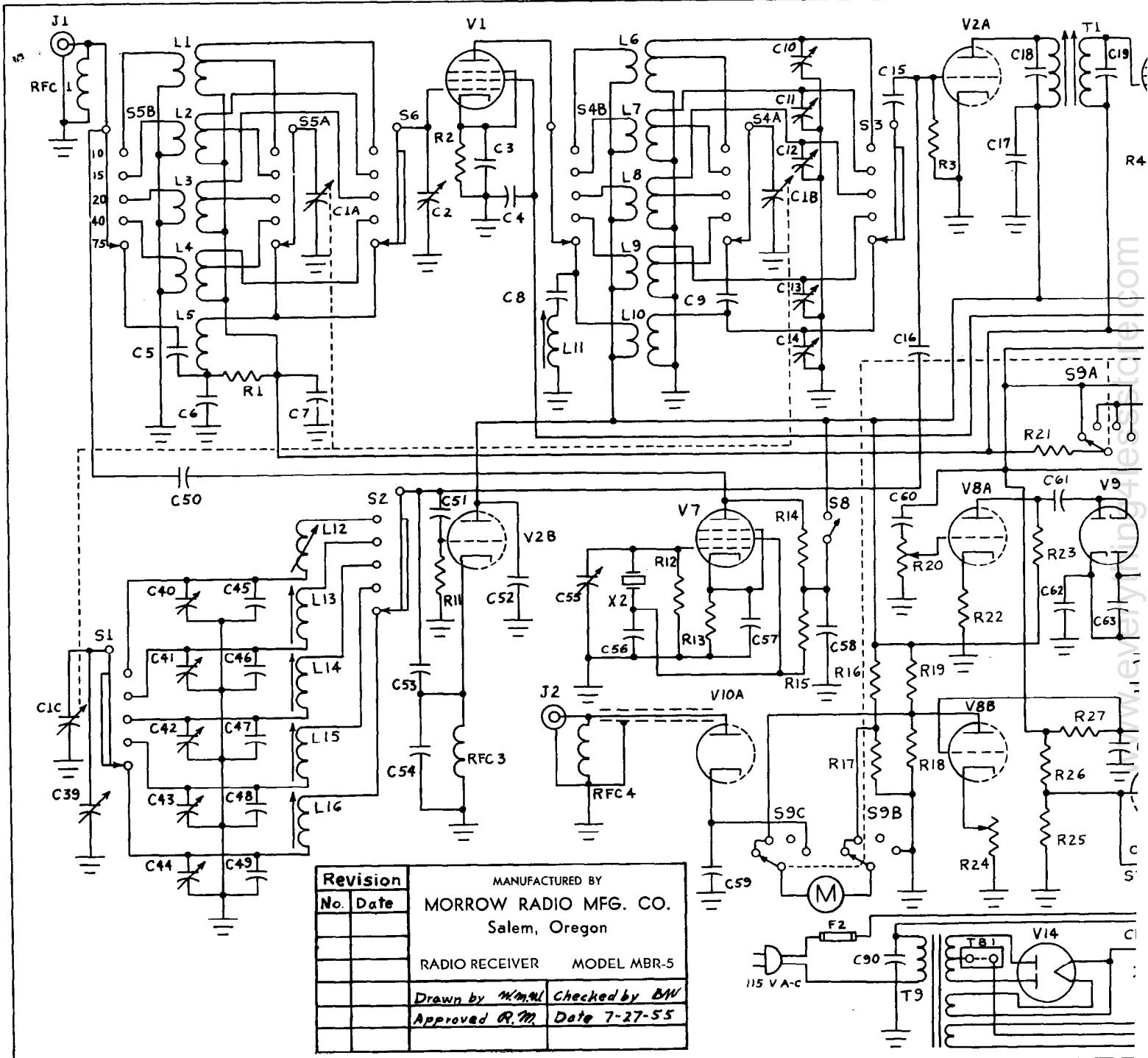
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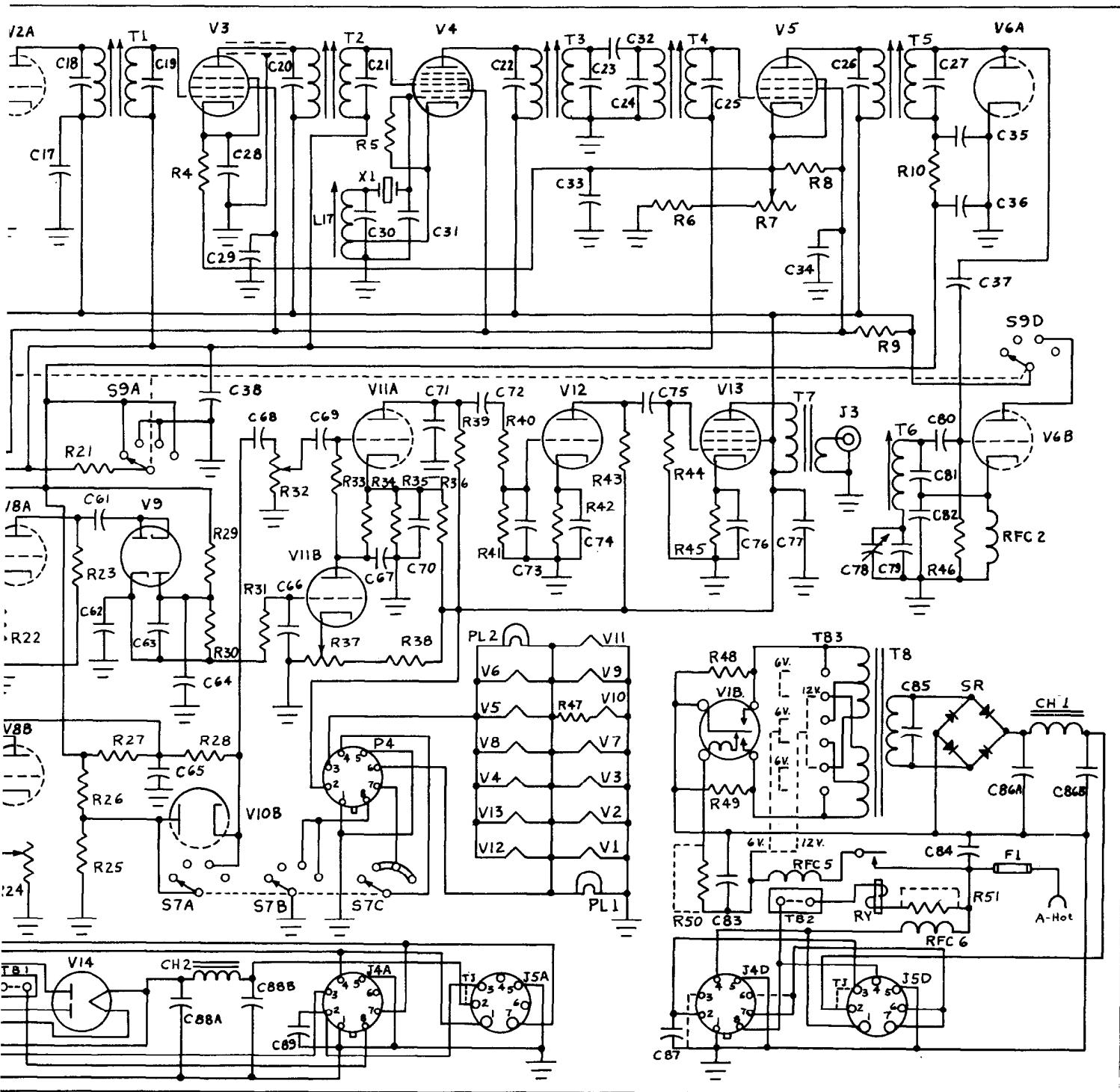
(cont. 6)

V1	6BZ6 RF amplifier
V2A	12AT7 first mixer
V2B	12AT7 local oscillator
V3	6BJ6 first IF amplifier
V4	6BE6 second mixer and crystal oscillator
V5	6BJ6 second IF amplifier
V6A	6T8 diode detector, AVC rectifier
V6B	6T8 triode B.F.O.
V7	6BJ6 100 KC crystal calibrator oscillator
V8A	12AT7 triode noise amplifier
V8B	12AT7 triode VTVM
V9	6AL5 diode noise balance rectifier
V10A	6AL5 diode field strength meter rectifier
V10B	6AL5 diode noise limiter
V11A	12AX7 triode first audio amplifier
V11B	12AX7 triode D-C squelch control amplifier
V12	6C4 second audio amplifier
V13	6AQ6 audio power amplifier
V14	5Y3GT A-C power supply rectifier
X1	1725 KC crystal in FT-243 holder plus or minus .01%
X2	100 KC crystal JK H-17TL
V1B	Vibrator Mallory 4501, 1501, 859
SR	Selenium Full Wave Bridge Rectifier A40-1 4 units of 65 MA each
Ry	Relay 6v D-C SPST A55-8
PL1	Pilot lamp, 6-8 v, 150 MA, GE #47
PL2	Pilot lamp, 6-8 v, 150 MA, GE #47



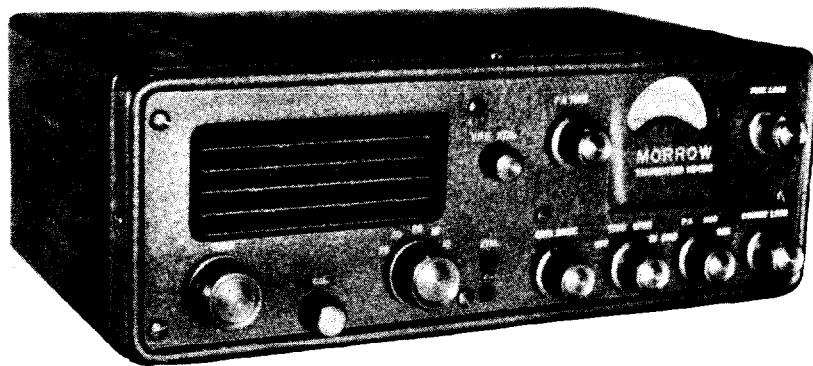






The New MORROW MB-560 Transmitter

90 Watt C. W., 60 Watt Phone All Band Companion
to the MORROW MBR-5 Receiver



1. VFO or XTAL — Extremely stable VFO directly calibrated for 80, 40, 20, 15 and 10 meter bands. Xtal socket and OSC calibrate control on front panel.

2. ZERO-BEAT CONTROL — Allows operator to accurately zero-in on incoming signals without turning final amplifier on.

3. 6146 POWER AMPLIFIER — Efficient circuit delivers maximum power to antenna. Special two-section tuning capacitor allows band-spreading on 20, 15, and 10 meters.

4. PI-NETWORK OUTPUT — Circuit allows matching to wide range of antenna impedance for fixed, portable or mobile operation.

5. NEGATIVE CLIPPER — Push-pull Class "AB1" modulators with negative speech clipping for 100% high level modulation.

6. BUILT-IN RELAYS — Relays for controlling antenna and receiver silencing are built-in in the MB-560 Transmitter.

7. FULLY METERED — All necessary circuits are metered by front panel meter and selector switch.

8. TUBE LINEUP — 6146 PA 6AQ5 frequency multiplier, 6CL6 VFO and Xtal OSC, 2 6CU6 modulators, 12AX7 driver, 6AU6 amplifier, 2 OB2 VR's.

9. POWER REQUIREMENTS — Operates on 6 or 12 volts. Requires 300-600 volts at 200 ma. and 250 volts at 75 ma. Latter voltage normally supplied by companion MBR-5 Receiver.

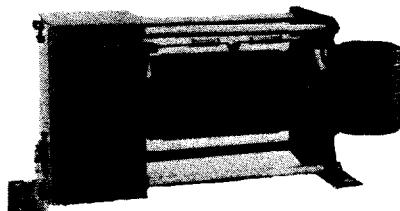
10. SMALL AND SOLID — Sturdily constructed of heavy aluminum for years of reliable service. Compact: 4" high x 11 $\frac{1}{4}$ " long x 6 $\frac{1}{2}$ " deep. Amateur Net \$189.50

11. POWER SUPPLIES — PWR 6-12 DC exciter power supply \$29.95.

PWR 115V AC power supply for fixed operation for MBR-5 Receiver and MB-560 Transmitter \$29.50.

AC power pack for Receiver and Transmitter complete, available on request.

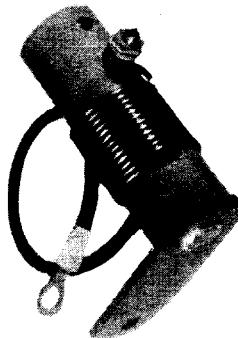
Interconnecting harness for using the MB-560 Transmitter and MBR-5 Receiver available as an accessory.



MLV-50

The **MORROW MLV-50** is a motor driven variable inductor used to tune a mobile whip antenna to operating frequency. The operator can change the frequency of a mobile transmitter and load it to the antenna by remote control from the driver's seat. The MLV-50 Unit may be used for antenna tuning on the 75, 40, 20, 15 and 10 meter bands. Normally, installed in automobile trunk near whip base.

Supplied with coaxial fitting for feed line, mounting base, remote control reversing switch and cable. Amateur Net \$24.95.



GC-10
GC-20

The **MORROW GC-10 and GC-20 GENERATOR NOISE FILTERS**. A tuned circuit RF "hash" filter for 10 or 20 meter bands. Engineered to attenuate generator noise created by brush sparking. Easy to install, simple to adjust. Just tune the parallel trimmer to minimum audible hash level in receiver.

Complete with instructions: Amateur Net \$3.75.